

Claims

1. A surface acoustic wave device including a structure in which a surface acoustic wave element provided with two kinds
5 of surface acoustic wave filter structures having different center frequencies on the same piezoelectric substrate is disposed on a package, the surface acoustic wave element comprising:

a first filter structure having a first center frequency;

10 a second filter structure having a second center frequency; and

a shield electrode between the first filter structure and the second filter structure, which is connected to an earth terminal of the package to be grounded.

15 2. The surface acoustic wave device of Claim 1, the surface acoustic element further comprising:

a connection pattern which connects an earth terminal pattern of either the first filter structure or the second filter structure to the shield electrode.

20 3. The surface acoustic wave device of Claim 1, in which the shield electrode has a first shield electrode and a second shield electrode, the surface acoustic wave element further comprising:

a first connection pattern which connects an earth
25 terminal pattern of the first filter structure to the first

shield electrode; and

a second connection pattern which connects an earth terminal pattern of the second filter structure to the second shield electrode.

- 5 4. The surface acoustic wave device of any of Claims 1 to 3, further comprising:

a pattern in which the shield electrode crosses a signal wire lead connecting at least one signal line terminal pattern in the first filter structure and the second filter structure
10 to a signal terminal of the package, and

wherein the shield electrode is connected to earth terminals of the package by at least two earth wire leads.

5. The surface acoustic wave device of any of Claims 1 to 4,

15 wherein the shield electrode is formed to be longer than the first filter structure and the second filter structure so as to segment the first filter structure and the second filter structure.

6. The surface acoustic wave device of Claim 4 or 5,

20 wherein the two earth wire leads connecting the shield electrode to earth terminals of the package are arranged at both sides of the signal wire lead connecting the signal line terminal pattern to the signal terminal of the package.

7. The surface acoustic wave device of Claim 5,

25 wherein the earth wire leads are respectively connected

to earth terminals disposed at opposite positions of terminal portions of the package in which the surface acoustic wave element is housed.

8. The surface acoustic wave device of any of Claims 1 to 5 7,

wherein the first filter structure, the second filter structure and the shield electrode of the surface acoustic wave element are disposed in a vertical direction to a propagation direction of surface acoustic wave of the first filter structure and the second filter structure.

9. The surface acoustic wave device of Claim 8,

wherein the first filter structure and the second filter structure are ladder circuits connecting one-terminal surface acoustic wave resonators in series arms and in parallel arms, and a surface acoustic wave resonator which is nearest to the second filter structure in the first filter structure having a relatively low center frequency is a parallel arm, and a surface acoustic wave resonator which is nearest to the first filter structure in the second filter structure is a series arm.

10. The surface acoustic wave device of Claim 8 or 9,

wherein the shield electrode has a grating shape including plural slits in a vertical direction to comb-shaped electrodes in the first filter structure and the second filter structure.

11. The surface acoustic wave device of any of Claims 1 to 25 7,

wherein the first filter structure and the second filter structure of the surface acoustic wave element are disposed in parallel to a propagation direction in surface acoustic wave of the first filter structure and the second filter structure, and the shield electrode is disposed in a vertical direction to the propagation direction of surface acoustic wave.

12. The surface acoustic wave device of Claim 11,

wherein the shield electrode has a grating shape including plural slits in a parallel direction to comb-shaped electrodes in the first filter structure and the second filter structure.

13. The surface acoustic wave device of Claim 8, 9 or 11,

wherein the shield electrode has a grating shape including plural slits in an oblique direction to a propagation direction of surface acoustic wave in the first filter structure and the second filter structure.

14. The surface acoustic wave device of Claim 10, 12 or 13,

wherein the slits of the shield electrode are formed by pitches between the minimum pitch and the maximum pitch of comb-shaped electrodes included in the first filter structure and the second filter structure.

15. The surface acoustic wave device of Claim 10, 12 or 13,

wherein the slits of the shield electrode are formed by different pitches depending on positions.

16. The surface acoustic wave device of Claim 1,

wherein an earth terminal pattern of the filter structure

of which center frequency is relatively higher in the first filter structure and the second filter structure is connected to the shield electrode by a connection pattern, at least two earth wire leads are connected to the shield electrode and the earth terminal pattern, and the earth wire leads are respectively connected to the earth terminals disposed at both sides in the package, sandwiching the surface acoustic wave element.

17. The surface acoustic wave device of Claim 1,

wherein an earth terminal pattern of the filter structure of which center frequency is relatively lower in the first filter structure and the second filter structure is connected to the shield electrode by a connection pattern, at least two earth wire leads are connected to the shield electrode and the earth terminal pattern, and the earth wire leads are respectively connected to the earth terminals disposed at both sides in the package, sandwiching the surface acoustic wave element.

18. The surface acoustic wave device of any of Claims 1 to 17,

wherein the first filter structure and the second filter structure are respectively a transmission filter and a reception filter, and the transmission filter and the reception filter forms a surface acoustic wave duplexer.

19. The surface acoustic wave device of claim 18,

wherein the signal line terminal pattern is an input/output terminal pattern of either the transmission filter

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or the reception filter.